What is claimed is:

1. A showerhead diffuser apparatus for a CVD process, comprising:

a first channel region having first plural independent radially-concentric channels and individual gas supply ports from a first side of the apparatus to individual ones of the first channels;

a second channel region having second plural independent radially-concentric channels and a pattern of diffusion passages from the second channels to a second side of the apparatus;

a transition region between the first channel region and the second channel region having at least one transition gas passage for communicating gas from each first channel in the first region to a corresponding second channel in the second region; and

a vacuum seal interface for mounting the showerhead apparatus to a CVD reactor chamber such that the first side and supply ports face away from the reactor chamber and the second side and the patterns of diffusion passages from the second channels open into the reactor chamber.

2. The showerhead apparatus of claim 1 wherein the second side comprises a flat surface such that the diffusion passages from the second channels open into the reactor chamber on a plane.

3. The showerhead apparatus of claim 1 wherein the vacuum seal interface comprises a flange having bolt holes and an o-ring for mounting to and sealing to a wall of the reactor chamber.

4. The showerhead apparatus of claim 1 wherein the supply ports into the first channels and the transition passages from the first channels into second channels are offset in position such that no supply port is aligned with a transition passage.

5. The showerhead apparatus of claim 1 wherein the transition passages into the second channels are offset from the diffusion passages into the reactor chamber such that no transition passage is aligned with a diffusion passage.

6. The showerhead apparatus of claim 1 further comprising coolant channels in walls separating second channels in the second channel region, the coolant channels interconnected such that a single inlet port and a single outlet port provides coolant through al of the coolant channels.

7. The showerhead apparatus of claim 6 comprising an inlet and an outlet supply tube extending from the first side connecting to the inlet ad the outlet ports.

8. A CVD reactor system, comprising:

a reactor chamber having an opening for a showerhead apparatus;

a support in the chamber adjacent the opening , the support for a substrate to be processed; and

a showerhead diffuser apparatus for a CVD process, the showerhead having

a first channel region having first plural independent radially-concentric channels and individual gas supply ports from a first side of the apparatus to individual ones of the first channels, a second channel region having second plural independent radially-concentric channels and a pattern of diffusion passages from the second channels to a second side of the apparatus, a transition region between the first channel region and the second channel region having at least one transition gas passage for communicating gas from each first channel in the first region to a corresponding second channel in the second region, and a vacuum seal interface for mounting the showerhead apparatus to a CVD reactor chamber such that the first side and supply ports face away from the reactor chamber and the second side and the patterns of diffusion passages from the second channels open into the reactor chamber.

9. The CVD reactor system of claim 8 wherein the second side comprises a flat surface such that the diffusion passages from the second channels open into the reactor chamber on a plane.

10. The CVD reactor system of claim 8 wherein the vacuum seal interface comprises a flange having bolt holes and an o-ring for mounting to and sealing to a wall of the reactor chamber.

11. The CVD reactor system of claim 8 wherein the supply ports into the first channels and the transition passages from the first channels into second channels are offset in position such that no supply port is aligned with a transition passage.

12. The CVD reactor system of claim 8 wherein the transition passages into the second channels are offset from the diffusion passages into the reactor chamber such that no transition passage is aligned with a diffusion passage.

13. The CVD reactor system of claim 8 further comprising coolant channels in walls separating second channels in the second channel region, the coolant channels interconnected such that a single inlet port and a single outlet port provides coolant through al of the coolant channels.

14. CVD reactor system of claim 13 comprising an inlet and an outlet supply tube extending from the first side connecting to the inlet ad the outlet ports.

15. A method for distributing gases to a wafer in a CVD coating process, comprising steps of:

(a) introducing gases for the process via individual supply ports into individual ones of plural radially-concentric first channels of a first channel region of a showerhead apparatus;

(b) flowing the gases from the first channels via transition passages into corresponding radially-concentric second channels in a second channel region; and

(c) diffusing the gases from the second channels through diffusion passages opening through a flat surface of the showerhead apparatus parallel to and adjacent the wafer to be coated.

16. The method of claim 15 wherein the supply ports, the transition passages and the diffusion passages are arranged to be non-linear.

17. A method for adjusting gas flux distribution over a wafer in a CVD coating operation, comprising steps of:

(a) introducing gases for the coating operation via individual supply ports into individual ones of plural radially-concentric first channels of a first channel region of a showerhead apparatus;

(b) flowing the gases from the first channels via transition passages into corresponding radially-concentric second channels in a second channel region;

(c) diffusing the gases from the second channels through diffusion passages opening through a flat surface of the showerhead apparatus parallel to and adjacent the wafer to be coated; and

(d) adjusting the gas flux distribution over the wafer by individually metering mass flow to individual ones of the individual supply ports to the first channels.

18. The method of claim 17 including a step for adjusting gas flux distribution by shifting individual gases between individual first channels of the first channel region.